

Hydrogen and Fuel Cell Activities in the State of California: A Status Report



Compiled by Energy Independence Now

Hydrogen in Transportation

Today

- California produced nearly 649 million metric tons of hydrogen in 2002, over 32% nationwide production¹
- There are currently 41 light-duty hydrogen-fueled cars, 2 buses, and one off-road vehicle, and 2 watercraft being demonstrated in California today.
- Over 200,000 vehicle-miles traveled





Hydrogen in Transportation

Planned

Auto manufacturers have announced plans to place approximately 150 vehicles on California's roads in the next few years.

- DaimlerChrysler will place 37 vehicles on California's roads in the next year
- Ford intends to place 10 vehicles in Sacramento
- Honda, Toyota, and Nissan will add a combined 65 vehicles in next 5 years
- BMW will provide 15 hydrogen internal combustion engines in next 5 years
- Hyundai has pledged 32 vehicles over 5 years
- Count towards:
 - California Zero-Emission Vehicle (ZEV) rule of 250 vehicles by 2008
 - CaFCP goal of 300 vehicles in 4 years

Hydrogen Transportation Infrastructure

There are currently 13 existing hydrogen fueling stations across the state.
There are confirmed plans for 19 additional stations



Hydrogen Initiatives

Government

•United States Department of Energy

- Providing \$350 million over 5 years nationwide for hydrogen projects as part of \$1.2 billion program
- Key research areas will include hydrogen storage, vehicle fuel cell research, hydrogen education and developing implementation strategies. The funding grants for California will total between \$35 and \$50 million over the next five years.
- 35 California universities, laboratories, government agencies, and companies will receive grants in 4 program areas (hydrogen storage, vehicle and infrastructure learning and demonstration, fuel cell research, hydrogen education).





Hydrogen Initiatives (cont'd)

- **South Coast Air Quality Management District**

- Since 1991, the AQMD has awarded over \$16M for fuel cell and hydrogen activities, leveraging over \$136M of outside funds.
- In 2003, the AQMD awarded a total of \$7.6 million for Technology Advancement Projects, \$3.1 million toward fuel cell and hydrogen technologies.
 - Priorities for 2003 and beyond include 10% for hydrogen technology & infrastructure and 14% for fuel cell technology
- Nine stations are currently under construction investigating a variety of technologies (AQMD station will be operational this month).
- AQMD Five-Cities Program
 - 30-35 hybrid hydrogen internal combustion engine vehicles in 5 South Coast cities: Burbank, Ontario, Santa Ana, Riverside, Santa Clarita.
- Additional stations will be considered depending on available funding, strategic location, and co-deployment with vehicles.





Hydrogen Initiatives (cont'd)

•California Air Resources Board

- ZEV Regulations: Alternative Compliance Path (FCV totals) with technology review in 2006
 - 2001 - 2008: 250 vehicles
 - 2009 - 2011: 2,500 vehicles
 - 2012 - 2014: 25,000 vehicles
 - 2015 - 2018: 50,000 vehicles
- AB 1493 - Requires ARB to set emission standards for greenhouse gas emissions from light-duty mobile sources
 - Regulations will be adopted by Jan, 2005 and apply to 2009 and later model years
- Zero Emission Bus regulations
 - Large diesel fleets must demonstrate zero emission buses
 - ZEB feasibility review in 2006
 - 15% purchase requirements for 2008+ (diesel fleets) and 2010+ (alt. fuel fleets)



California

Air Resources Board





Hydrogen Initiatives (cont'd)

- **California Energy Commission**
 - Research, Development, Demonstration
 - Hydrogen infrastructure projects
 - Studies
 - H2 Fueling Station Guidelines, Failure Modes and Effects Analysis on Hydrogen Stations, Combined Natural Gas and Hydrogen Fueling Options, Supply and Demand Analysis for Future Hydrogen Use, Opportunities for Hydrogen Fueling Infrastructure in California
 - Support for the California Fuel Cell Partnership
 - Future role in demonstration projects, codes & standards development, infrastructure planning, permitting assistance, R&D activities, and technical support





Hydrogen Initiatives (cont'd)

- **California Fuel Cell Partnership**

- Fleet and fueling demonstrations, real-world testing, market preparation, codes & standards development, public awareness
- Have placed 55 vehicles on roads logging over 145,000 miles
- Installed 2 hydrogen stations and constructed demonstration facility
- Trained first responders
- 120 public-outreach events, distributed over 3,800 education kits
- Mandate extended through 2007





Hydrogen Initiatives (cont'd)

- **University of California**
 - Performing extensive research and development of vehicles, infrastructure, production and market conditions
 - Vehicle and station design
 - “Hydrogen Pathways” research and reports
 - Real-world operations and testing of hydrogen ICE and FC vehicles and hydrogen production and distribution facilities
 - UC-Davis and UC-Irvine recipients of recently announced DOE grants
- **California State University – Los Angeles**
 - Undergraduate and graduate level programs to train and educate students on hydrogen vehicles
 - Plans to construct hydrogen fueling station on campus





Hydrogen Initiatives (cont'd)

WestStart/CALSTART

- “Clean Mobility” Initiative
 - \$2 million effort will identify and develop innovative solutions to meet the "last mile" gap for transit riders and to enhance the development of hydrogen and fuel cell bus activities within the U.S.
- Fuel Cell Bus Initiative Goals
 - work to develop a 6 year, \$25 million/yr program to address major commercialization challenges
 - focus on reducing technical and cost barriers for fuel cell use
 - use transit demonstrations as “rolling classrooms” for fuel cell education
- Clean Car Maps
 - web-based alternative fuel station finder





Hydrogen Initiatives

Corporate & Other

- Vehicle Suppliers
 - Honda, Toyota, DaimlerChrysler, Ford, Hyundai, Nissan, General Motors, BMW, Volkswagen, Anuvu, Hydrogen Car Company, ISE Corp
- Fuel Suppliers
 - Stuart Energy, Air Products, Praxair, Proton, ChevronTexaco, BP, Shell, Hyradix and more
- Transit Companies/Agencies
 - AC Transit
 - Sunline Transit
 - Chula Vista
 - SF Muni
- Miscellaneous projects
 - BioConverter, LLC
 - InEnTech Medical
 - Solar Integrated Technologies
- California Hydrogen Business Council - 66 members



Hydrogen Initiatives

Non-Profit/Associations

- American Lung
- Apollo Alliance
- Bluewater Network
- California Federation of Labor
- WestStart/CalStart
- CEERT
- Coalition for Clean Air
- Energy Independence Now
- Environment California
- EPRI
- Gas Technology Institute
- Greenpeace
- National Hydrogen Association
- NRDC
- Union of Concerned Scientists
- U.S. Fuel Cell Council



Stationary Applications

California Stationary Fuel Cell Collaborative

- “a joint initiative of federal, state, and non-governmental organizations interested in the acceleration of stationary fuel cell commercialization in the state of California and beyond.”
- **Other State Initiatives:**
 - CPUC Self-Gen Program
 - CEC Buydown Program
- State has over 100 MW production capacity, expected to double by 2006
- 27 stationary fuel cell installations
- Nearly 2800 kW installed fuel cell power. Expected to double annually.
- Key consumers include hospitals, universities, utilities, industrial processing facilities, and government buildings.



Hydrogen Legislation

AJR 50

- Resolution declares California's commitment to support the development of commercial hydrogen and fuel-cell vehicle technology and calls for federal funding for California

•AB 1966

- Requires CARB, CalTrans, PUC, and CEC to adopt statewide guidelines for the production and licensing of hydrogen fueling stations.

•HR 4205

- Provides 50% tax credit for installation of hydrogen fueling stations
- Introduced April 22, 2004. Referred to House Ways & Means



California Hydrogen Highway Network

“BE IT FURTHER ORDERED that California's 21 interstate freeways shall be designated as the ‘California Hydrogen Highway Network’ and the California Environmental Protection Agency and all other relevant state agencies...shall work with state legislators and key stakeholders...to implement this Executive Order, plan and build a network of hydrogen fueling stations along these roadways and in the urban centers that they connect, so that by 2010, every Californian will have access to hydrogen fuel, with a significant and increasing percentage produced from clean, renewable sources...”



Core Values Driving Hydrogen Blueprint Plan

- **Energy independence**
- **Energy security & diversity**
- **Reducing air pollution**
- **Reducing global warming emissions**
- **Protecting public health**
- **Economic competitiveness**
- **Job creation**

Stated 2010 Goals

- Access to hydrogen fuel for all Californians
- Significant and increasing percentage of hydrogen produced from clean, renewable sources
- Hydrogen-powered cars, trucks, buses, and generators be commercially available for purchase by California consumers, businesses and agencies
- When possible State vehicle fleet to include increasing number of clean, hydrogen powered vehicles to be purchased during normal course of fleet replacement

Stated 2010 Goals (cont'd)

- Hydrogen safety standards, building codes, emergency response procedures, and training for key officials be in place
- Provide appropriate incentives to encourage the development of hydrogen fueling infrastructure and the purchase of hydrogen-powered vehicles
- Provide appropriate incentives to encourage the development of renewable sources of energy for hydrogen production